Periscope.

a.—ANATOMY AND PHYSIOLOGY OF THE NERVOUS SYSTEM.

THE FUNCTIONS OF THE CEREBELLUM.—Nothnagel *Virchow's Archiv.* LXVIII., I. 59, sums up, as follows, the conclusions drawn from his investigations as to the functions of the cerebellum. He states, however, that as he did not aim to make an exhaustive work on this organ, these conclusions are only the results of his experiments, as far as they went.

(1.) The cerebellum acts in certain motor processes, its function is therefore, in a certain sense, a motor one. This connection with phenomena of motility is evidenced in excitation, as well as in destroying experiments.

(2.) In all probability there are functional (and therefore also anatomical) connections between the two halves of the cerebellum.

(3.) Complete destruction of the same portion of the cerebellum, irritation of which produced definite transient motor effects, had no visible permanent effects ("*Ausfallserscheinungen*" Goltz), as a result.

(4.) The destruction of one hemisphere, of both hemispheres alone, or of the anterior upper portion of the vermis alone, produces no disturbance of co-ordination. On the other hand, mechanical irritation of these parts is followed by motor irritative phenomena.

(5.) The recognized disturbances of co-ordination follow only such injuries in which the mass of the hemispheres and the vermis are simultaneously involved.

THE FUNCTIONS OF THE CORPORA QUADRIGEMINA.—Prof. Kohts, of Strasburg, publishes *Virchow's Archiv.*, LXVII., Hft. 4, a paper on the functions of the corpora quadrigemina, taking, as his text, a case of a man in whom the symptoms, during life, were vomiting, severe headache, optic neuritis, bilateral paralysis of the motor oculi nerves, etc. The symptoms in this case he divides according to the time of their occurrence into two series, the first, comprising those which were observed for a period of some ten months previous to a fall which developed the second series, consisted first in disordered locomotion, and after a few months alternate divergent strabismus, temporary trouble with the bladder, irritative and paralytic phenomena in the region of certain motor and crania

nerves besides those implicated in the production of the strabismus; there were no troubles of speech nor complaints of pain, as in ataxia, no involuntary movements or disturbance of sensibility.

The second period of the disease came on, as stated, very suddenly after a fall, and the symptoms were those indicating a cerebral tumor; intermittent paroxysms of pain in the occiput, vomiting, a noticeable tendency to fall forward to the right, and sometimes backward, and optic neuritis. The autopsy revealed a tumor of the size of a cherry, occupying and destroying the posterior corpora quadrigemina.

Dr. Kohts follows this with a detailed account of experiments on frogs, pigeons, and dogs, and, from the whole, deduces the following conclusions:

(1.) The centre for the maintenance of the equilibrium on which the finer adjustment of the movements depends, is situated in frogs (confirmation of Goltz's experiment), and in birds in the lobi optici, which correspond to the corpora quadrigemina of the higher animals.

(2.) The posterior corpora quadrigemina are to be classed among the co-ordination centres, since after their destruction the co-ordination of complicated combinations of movements is impossible.

(3.) It may be accepted that the disorder of the muscular sense, the ataxia, in injuries to the corpora quadrigemina, is dependent usually upon a lesion of the tegmentum (*Haubenbahn*), which, according to Meynert's researches, serves for a route for reflex impulses, and takes its origin in the thalamus and corpora quadrigemina.

The Sensation of Sound.—At a recent meeting of the Vienna Academy, a paper was communicated by Dr. Isidor Hein, "On the Relations between Perceptions of Touch and of Hearing." His conclusions are these: 1. The sound produced by striking a solid body is always accompanied by a sensation of touch, which, like the sound, differs according to the nature of the body. If the sound is different in different parts of a body, there goes along with the variation of the sound a variation in the touch sensation; and if the surface be divided into several sections, according to differences in sound, a convenient division may be made on the basis of touch. 2. On bringing a struck body towards a reflecting wall, the sound and touch-perceptions show similar variations. 3. To the touch-perception in question correspond vibratory motions of the exterior body, produced even with the weakest striking, whereas sound only begins to be perceived with impacts of a certain intensity. 4. The sense of touch is capable of perceiving vibrations and comparing the differences of these. It brings hereby to consciousness, a special quality of touch-sensation, which is to be distinguished from sensation of pressure. 5. This distinguishing power of the organ of touch, not sufficiently appreciated hitherto, offers practical medicine a peculiar mode of investigation, which greatly enlarges the doctrine of the physical symptoms of the human organization, and for which the author suggests the (German) name of "Erschutterungs-palpation." *Nature*, November 30.

THE INFLUENCE OF FARADIZATION AND GALVANIZATION OF SPECIAL NERVES IN MAN ON THE LOCAL TEMPERATURE.—The following are the results of a series of experiments by Przewoski, undertaken at the investigation of Eulenberg, and reported at the meeting of the Med. Verein at Greifswald, August 5, 1876, (*Deutsche Med. Wochenschrift*) No. 43. The temperature variations were measured, partly by thermo-electric methods, and partly by thermometers.

(1.) Faradization of the cervical sympathetic of one side caused an immediate cooling of the cheek of that side, (according to the length of the application, from 2 to 12 minutes, ranging from 0.5° to 1.75° Cent.). This lowering of temperature continued for some time after the discontinuance of the irritation, finally giving way to an elevation of temperature of 0.5° cent. above the original figure.

(2.) Fradization of the ulnar nerve caused an immediate decrease of temperature in the region supplied by it, between the third and fourth fingers, of from 0.7 to 2.53 cent.

(3.) Irritation of the peroneal nerve causes a rapid fall in the thermometer attached to the outer margin of the foot, or between the fourth and fifth toes. The decrease of temperature is more considerable than with faradization of the sympathetic or the ulnar nerve, (amounting to 3.6° C.).

(4.) Application of the constant current, particularly in the way of cathode closure, to the right cervical sympathetic, causes a lowering of temperature in the right cheek and hand. That of the cheek is still more considerable than that of the hand. It occurs in both (thermo-electrically determined) directly after the closure of the circuit, and undergoes a gradual increase during the time of the application of the cathode.

(5.) Application of the mode to the cervical sympathetic causes, on the other hand, a noticeable, though slight increase of temperature in the corresponding hand and cheek, after the closing of the circuit.

(6) Closure of the cathode on the ulnar nerve causes a decrease of temperature between the fourth and fifth fingers of the hand (in one case 1°. 0 C., lasting 40 seconds; in another 1.06° C., for 65 seconds). Application of the anode, on the contrary, was followed by a rise of temperature in the same region, (as much as 1.5° C., for 25 seconds.).

THE INNERVATION OF THE SUB-MAXILLARY GLAND.—The following are the conclusions of an article by G. Giannuzzi, *Lo Sperimentale*, April, 1876, (abst. in *Revue des Sci. Médicales*), on the influence of the sympathetic in the secretory functions of the sub-maxillary gland:

1. The cervical sympathetic has an influence on the sub-maxillary secretion, varying in intensity in the different varieties of dogs operated upon.

2. This influence is always well marked, and manifests itself sometimes on the gland, sometimes on the neighboring parts.

3. The secretory nerves of the sympathetic are furnished by the third and fourth dorsal roots; they are altogether different from those that affect the pupil.

4. The vaso-motor come from the fifth or sixth dorsal roots.

5. Even after the section of the chorda tympani, we can provoke reflex action of the glands by exciting the buccal mucous membrane. This phenomenon is not constant in all dogs, and is not easily observed when the cord has been cut some days previous to the experiment.

6. The action of the sensory nerves on the salivary secretion is not due to an increase of the circulation, but to a reflex influence exercised on both the secretion and the circulation.

7. The excitation of the superior portion of the cervical cord, instead of diminishing the flow of blood in the glandular vein, increases it.

8. When we irritate the first dorsal roots, we have an argumentation of the cardiac pulse. The author promised to study this last influence in a future memoir, but unhappily, his very recent death prevents us from obtaining the results of the continuance of his investigations.

THE PHYSIOLOGY OF THE LACTEAL SECRETION.—Dr. A. Roehrig, *Virchow's Archiv.* LXVII., I. 119, publishes an interesting paper on the physiology of the secretion of milk, and especially its nervous mechanism.

The failure, or negative results of Eckhard's experiments in this direction are attributed by Roehrig to his having failed to consider that the lacteal glands do not possess an excretory duct that is in constant functional activity, but that artificial aid, in the way of suction, is required. In his own experiments, which were performed on goats, he overcame this difficulty by the aid of a special form of catheter, which he describes.

Having first determined the regular rate of secretion by experiment, the author next investigates the influence of the nerves supplying the glands, upon the secretion. Excluding the cutaneous nerves of the udder of the goat, these are derived from the external spermatic nerve, which, arising by two roots from the lumbar portion of the cord, divides into three branches, the upper one of which (the animal being in the dorsal position), passes to the abdormal muscles, while the other two follow the crural and external pudendal arteries to the udder. These two latter are the only ones that are of interest in this connection, and of these, the first, or the middle branch of the spermatic nerve, gives out, in addition to certain cutaneous branches, three twigs, as follows:

(1.) A small twig which follows the course of the vasa pudenda exterior, in order to ramify on its walls.

(2.) A much larger *ramus papillaris*, which may be followed into the teat.

(3.) One, rarely two, *rami glandulares*, which passes at once to the larger milk ducts, the cistern, and the principal evacuatory passages to ramify on their walls.

The inferior branch of the external spermatic nerve passes directly between the external pudendal artery and vein, not leaving them, but its stem may be traced to its finest branches, sometimes a little behind, sometimes directly between the vessels.

In order to prevent complications in his experiments, from struggling, on the part of the animals, the author employed narcotics and curare, and discovered an extraordinary tolerance of these drugs, in the goat. As much as eighteen grains (1.2 grammes) of morphia were given without the production of complete narcosis, and as much as two grains of curare (138 milligr.) injected into the cervical veins, to produce complete immobility.

The results of the experiments are given as follows:

(1.) Section of the papillary branch of the median divisions of the external spermatic nerve, is accompanied with no alteration in the process of the secretion of milk; the only visible effect is relaxation of the tissues of the teat, and a perceptible twinge on the part of the animal at the moment of the section.

Electrical irritation of the peripheral portion of the divided nerve caused a perceptible erection of the breast-warts, but had no influence over the milk secretion.

Centripetal irritation of the central portion of the nerve increased the secretion of milk in a reflex manner.

(2.) Section of the glandular branch, or of the whole median division, before its division into papillary and glandular branches, has for result a visible instantaneous slowing of the secretory process, while electric irritation of the separated nerve portion causes a perceptible quickening of the same.

(3.) Section of the inferior branch of the external spermatic nerve, which follows a course between the pudendal artery and vein, causes a very considerable increase in the amount of milk secretion (as much as twenty times its original amount); peripheral irritation of this nerve brings it to a stop.

From these results, Rochrig divides functionally the nerves of the milk gland into three classes:

(1.) Sensory, or reflex nerves.

(2.) Motor nerves.

a. Such as cause the erection of the udder prominences.

b. Tonic nerves, innervating the contractile elements of the milk passages.

(3.) Vaso-motor nerves, which render possible certain alterations in the calibers of the blood-vessels of the udder.

In other words, the median branch of the spermatic is a mixed nerve, sensory and motor, the former function being exercised by its papillary branch, and the motor power by it and the glandular division. The inferior division of the external spermatic nerve is, on the other hand, vaso-motor in its functions.

Dr. Rochrig likewise experimented upon the action on the milk secretion of various poisons that affect the vaso-motor centres, such as strychnia, caffeine, jaborandi, chloral hydrate, etc., and which might be

supposed to affect it more or less materially. With the subcutaneous injection of strychnia, which, from the great increase of blood-pressure that accompanies its use, might be supposed to be of much effect, it was found that the secretion was primarily very much increased, then diminished, and finally almost suppressed. This primary increase was not attributable to excitation of the glandular nerves, for these had been cut. The experiments with digitalis and caffeine had somewhat similar effects, but were complicated, in the case of the former, at least, with unpleasant symptoms of poisoning, goats being very sensitive to the action of digitalis. Jaborandi was found to exert a still greater influence than any other drug, in increasing the milk secretion; chloral hydrate and bromide of potash very notably diminished it. Experiments were also performed with graphic apparatus, and with sections of the vagi, which proved incontestably the connection between the secretion and the blood-pressure. The execution of the author's further design to test the connection between the lacteal glands and the sexual organs, was necessarily deferred on account of lack of material. He intends, however, to re-open the investigation on the first opportunity.

THE PHYSIOLOGY OF THE VAGUS.—Rossbach and Quellhorst, *Verhand. d. physik-med. Gesellsch. in Wurzburg*, IX. 13–31, (abstr. in *Centralbl. f. d. med. Wissensch.* No. 42, 1876), demonstrate that vaso-motor fibres pass in the lower vagus to the abdominal organs, and through their irritation a contraction of the abdominal vessels, and an increase of the blood-pressure is produced. In order to excite the abdominal vagus, the vertebral ends of certain ribs are resected laterally to the process of the vertebræ, and in this manner an opening is made in the thoracic walls, the vagi are dissected clear of the œsophagus, cut through, and the peripheral ends electrically or mechanically irritated. In both cases there was a notable increase of the blood-pressure in the carotid and crural arteries; the frequency of the pulse remained unchanged. If merely the cervical vagus was divided, and the heart stopped by irritation of its peripheral portion, there followed the cessation of the excitations a rise in the blood-pressure above the normal figure. According to Rossbach's observations, this increase took place also after the activity of the cardiac terminations of the vagus was excluded by the use of a moderate dose of atropine (0.004 gramme), so that excitation of the vagus can no longer produce stoppage of the heart, and in this case directly after the excitation. This increase of blood-pressure depends, according to Rossbach and Quellhorst, in either case upon the excitation of certain vaso-motor fibres, which traverse the vagus on their way to the abdominal organs; since it is regularly absent if the vagi are divided.

AT the Session of the French Acad. des Sciences, November 20, last, M. Onimus reported the results of his experiments on the pneumogastric and the pretended nerves of arrest. Many authors have considered that

the function of the pneumogastric was one of arrest; these authors had based their views on the fact that excitation of this nerve by induced currents, caused, at least for a few seconds, an arrest of the heart. M. Onimus has assured himself that, far from arresting the heart, a moderate and isolated excitation of the pneumogastric caused its contraction. When the excitations are too numerous, and very rapid, they have as a momentary result, an arrest, but it is only the consequence of a perturbation.

The Nerves of the Lungs.—At the session of the Biological Section of the British Association for the Advancement of Science, at its recent Glasgow meeting (rep. in *Nature*, September 21), Dr. Stirling, of Edinburgh, gave a very lucid account of his discovery of small nerve ganglia in many parts of the lung, and especially in relation to the bronchi at the base of the lung. These small collections of ganglion cells may be either in the course of the nerves, or at their forks. They are directly continued by two extremities into the gray or sympathetic nerve fibres. Dr. Stirling believed that these were local nerve-centres for the muscular fibres of the blood-vessels, controlling their calibre, and thus regulating the amount of blood passing through them.

Dr. Gardner threw out the idea that these local nerve-centres might have another function, that of regulating the capacity of different bronchi, and so varying the amount of air admitted to or expelled from particular regions of the lung. He had long believed that some such arrangement must exist, in consequence of stethescopic observations, both on the healthy and diseased subject. Dr. Stirling suggested that this regulating power might reside in the higher nervous centers, for stimuli could be sent down through any limited number of fibres of the whole respiratory nerves.

Effects of Excitation of Sensory Nerves on the Heart, Respiration, and Circulation.—M. Franck, Report of meeting of the French Association for the Advancement of Science in *L'Union Médical*, September 26.

The author adopts as a general formula, in summing up his observations, this idea of M. Cl. Bernard: "Arrest of the heart, or syncope, may be produced under the influence of an intense painful excitation of any nature whatever." Under the influence of a painful excitation, the heart is arrested, and this arrest is more or less marked according to the intensity of the impression, the sensibility of the animal, etc. Suppression of the pain by anaesthetics involves the suppression of the cardiac reaction, because the instrument of the cardiac manifestation is in default, the pneumogastric nerves being paralyzed.

The Electric Apparatus of the Torpedo.—At the session of the Acad. de Médecine, of Paris, October 17, 1876, rep. in *L'Union Médicale*, M. Charles Rouget read a communication relative to the electric apparatus of the torpedo, illustrated by microscopic photographs of the terminal nerve net-work. We have, in a former number, given the princi

pal points of a former communication describing these nerve terminations, to which M. Ronget refers in the remarks we quote below:

"It results," said the author, "from the histological analysis of the constituent elements of the electric disks of the torpedo, described in our two previous communications, that we do not meet in these organs, apart from the ramifications of nerve fibres, and the reticulated nervous plate, with anything but vessels and elements pertaining to the connective tissue (cells, fibres, membranes). The nerve elements alone are part of the category of organic formations (muscles and nerves), in which we observe a development, or rather a transformation of form. As Koelliker showed, as far back as 1857, the nerves themselves are the sole source of the electricity of the electric organ of the torpedo. By what mechanism do these nerve elements produce these effects? This is a question, the solution of which is, I believe, to-day possible. The trunks and the ramifications of the electric nerves possess, as we are aware, properties and functions similar to those of the motor nerves; they are centrifugal nerves, transmitting the discharging force necessary for the transformation of the organic potential energies (forces of tension) into active force. The action of the nervous discharge over the force of tension, accumulated by nutrition in the muscles (contractility), in the cells and net-works of the central gray matter (neurility), in causing to pass into the condition of active force, of mechanical work, of excito-motor force, sensation, or psychic action, is also exercised on the reticulated nervous plates in question, the structure and disposition of which presents the closest analogy with that of the net-works of the central gray substance in vertebrates (Gerlach), and of invertebrates (Leydig).

"In the muscles and the nervous centres, just as the activity of the organic forces is manifested under the forms of contraction, of sensation, or of thought, a fraction of these forces of tension passes into the condition of active force under the form of heat and electricity. In the reticulated nervous laminae of the electric apparatus, in which neither movement or sensation is manifested, nearly the whole potential energy (neurility), accumulated by nutrition in the terminal nerve net, is transformed into electricity. It is only a special case of these transformations of organic into cosmic forces, and inversely, which are the very essence of vital manifestations of life.

The following are the titles of some recent papers on the Anatomy and Physiology of the nervous system.

Heubel, On the Dependence of the waking condition of the Brain upon External Irritation, *Pflueger's Archiv.* XIV. 2 and 3 Hft.; Stefani, Studies on the Functions of the Semi-circular Canals and Relation of Experiments undertaken for the purpose of ascertaining their functional Relations with the middle Peduncle of the Cerebellum, *Lo Sperimentale*, Dec. 1875; Elischer, Nerves of the Ovary, *Centralbl. f. d. med. Wissensch.*, Dec. 9; Kuhnt, The Intermediate Medullary Sheath of the Nerve fibre, *Ibid.*, Dec. 2; Gergens, On Crossed Reflex Action, *Pflueger's Archiv.* XIV, VI and VII, Nov. 20; Langwieser, On Accountability, *Wiener med. Wochenschr.* Nov. 26.